VISION REPORT

# The Impact of Network Computers on the Federal IT Industry

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# Abstract

This report, *The Impact of Network Computers on the Federal IT Industry*, examines the status of network computer implementation in the federal environment, vendors playing key roles in the implementation, trends and market projections.

According to this report, the federal government has been slower to respond to network computers than its commercial counterpart. There are only a few pilot installations currently in place. Many factors have influenced this lag. Some factors include procurement cycles, the computing environment and agency culture. There is, however, a potential for the federal market for NCs to soar based on agencies becoming more familiar and comfortable with the technology and vendors dedicating time and effort to promoting the advantages of using NCs.

Not all agency functions can migrate from PC-based computing to a network computer environment. The choice of technology is due in large part to environmental and organizational factors as well as the functions of the individual user. The push to modernize including providing widespread web access to government workers, streamlining existing operations and new applications will drive increasing demand for desktop workstations of all types. It will be incumbent upon the vendors of NCs to ensure that their products are marketed in this space.

Once the advantages of the technology are understood, the market will climb dramatically. The federal market for network computers is expected to grow at a 115% compound annual growth rate (CAGR) over the next five years, with the size of the market moving from $12 million in FY 1998 to $550 million in FY 2003.

This growth is contingent on both agency and vendor dedication to the technology. This report examines those factors, both in the agency and vendor communities, which will influence this market growth.

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**Electronic Government**

*The Impact of Network Computers on the Federal IT Industry*

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# List of Exhibits

I

# Introduction

*The Impact of Network Computers on the Federal IT Industry* is produced by INPUT as part of the Federal Electronic Government Market Action Program (EG/MAP). This report assesses the market for Network Computers (NCs) in the U.S. federal government. Market forces and other factors affecting introduction of NCs into the federal market are examined and information is presented concerning the nature of the NC and where it is suitable in the federal environment.

EG/MAP was initiated by INPUT for information industry clients in the federal government market. Since the program began, INPUT annually asks interested clients to identify specific business areas, service modes and issues they consider essential for their federal market planning. Their suggestions have been incorporated into EG/MAP and have led to the selection of an annual forecast report and three market action projects as appropriate vehicles for providing the information. During calendar year 1998, under EG/MAP, INPUT will continue the program initiated in 1993 to publish profiles of federal agencies. These profiles provide an executive summary of information technology (IT) activities and trends in a federal agency, including mission, organization, program activities, program budget, IT budget, IT contract opportunities, top contractors and contracts and issues.

INPUT does not detail the full spectrum of information systems and services opportunities in each fiscal year because there are more than 35,000 individual procurements annually. Instead, EG/MAP examines the driving factors and establishes the basis for forecasting individual service mode growth prospects. INPUT selects major service modes for analysis based on both client interest and major program initiatives of the Administration. Major initiatives of the Administration begun in 1993 have created interest in programs dealing with business process reengineering (BPR), high-performance computing, network management, electronic mail (E-mail), electronic commerce, document management, the Internet and the World Wide Web (WWW).

As a complement report to this *Impact of Network Computers on the Federal IT Industry*, INPUT will publish its *Federal Information Systems and Services Market. FY 1998-FY 2003*. This market action project will assist the information technology vendor in examining the overall federal information technology market and provide insight into market trends and future opportunities.

The companion IMPACT (INPUT's Multiple Procurement Activities) program focuses on contract opportunities for significant new or recompete business potential for INPUT's vendor clients. More than 600 of these opportunities are provided in the Procurement Analysis Report (PAR) database and updated on the Internet daily. A newsletter summarizing recent database updates and procurement issues are distributed to INPUT's federal vendor clients monthly. However, the EG/MAP market action projects provide more strategic intelligence and trends within each delivery mode and by agency.

# A
# Scope

The objective of this study is to assess the market for Network Computers (NCs) in the U.S. federal government. Market forces and other factors affecting introduction of NCs into the federal market are examined and information is presented concerning the nature of the NC and where it is suitable in the federal market.

This study focuses on the class of network computer devices that attach to business networks and are used as individual user stations. There is a class of consumer network computer devices commonly referred to as Internet appliances such as web-enabled televisions, that were excluded for purposes of this study.

INPUT conducted primary and secondary research to obtain information regarding NC technology and its applicability to the federal market and information relating to the federal government market.

Federal NC market forecasts are presented in context with the worldwide and U.S. forecast for NC sales revenue and shipments.

Conclusions and recommendations are focused on providing NC vendors insight and actionable advice on how to improve their market position in federal NC sales.

This report covers only the U.S. federal government NC market and includes only those expenditures expected of the executive branch agencies. INPUT bases its analysis on actual outlays from FY1987 through FY1997, the federal estimate for FY1998 and the federal forecast for FY1999. Note that embedded computer systems are not included in our data. IT outlays for classified national defense and intelligence programs are also not included.

Funding information in this report is rounded to the nearest $100 million, unless otherwise noted. In general, the funding information is initially derived from plans and budget requests not yet approved by the Congress nor confirmed by the Office of Management and Budget (OMB) and may change even after approval. Such changes may be dictated by the Administration or subsequent congressional action.

# B

# Methodology

INPUT provided analysis through select agency interviews, careful review of its previous research and proprietary INPUT databases related to federal procurement activity to develop a summary of market forces and trends, market forecast and other NC market information contained in this report.

In addition, INPUT conducted a thorough literature search on the NC market including articles, reports and research publications and other published documents and company literature.

INPUT searched relevant web pages pertaining to companies, products, agencies and technical information to gather information. Leading NC vendors were also interviewed as part of this research process for this study.

To identify key expenditures in the service modes, INPUT analyzed the Office of Management and Budget (OMB)/General Services Administration (GSA)/National Institute of Standards and Technology (NIST) documents, the Budget of the United States Government, federal agency OMB Circular A-130 Information Technology Plans and federal agency OMB Circular A-11, Section 43 Information Technology Budget Requests.

Because agencies are not required to submit supporting data for plans to OMB, INPUT requested additional documentation on their OMB A-11 submissions and long-range information resource management plans and reviewed the documentation for guidance on the forecast. Interviews with agency policy and procurement officials were conducted to identify technology trends, policy changes and issues associated with plans to improve federal information resources and the acquisition process. Additional information on published policies and regulations is included. The section on market trends was prepared after the interviews and research on the current information technology budget submission were completed.

The INPUT forecast of five fiscal years' growth by service mode is based on the OMB A-11, Section 43 budget requests and off-budget plans covering various federal funds and public corporations.

Both agency and industry perspectives are gathered (see Exhibit I-1) to create a government user demand profile:

- INPUT extracts federal budget information from federal agency submissions made to the OMB. Agency strategic IT plans is gathered. Key agency information resource management (IRM) officers are interviewed for insights into future plans.

- INPUT gathers procurement data on 208 product/service codes (PSC) from the GSA Federal Procurement Data Center (FPDC) — federal agencies are required to report procurement data, including the contract obligation amount, on procurements exceeding $25,000. Vendors are interviewed for their impressions of the marketplace and its direction.

Exhibit I-1

**Gathering of Agency and Industry Perspectives**

# Methodology

- Agencies
  - Interviews
  - A-11 43s
  - Strategic Plans

- Vendors
  - Interviews
  - FPDC PSC Data
  - Strategic Direction

AGENCY PROFILES       PARs       CONTACTS EVENTS       FAIT       VENDOR PROFILES

FOCUS ON USER DEMAND
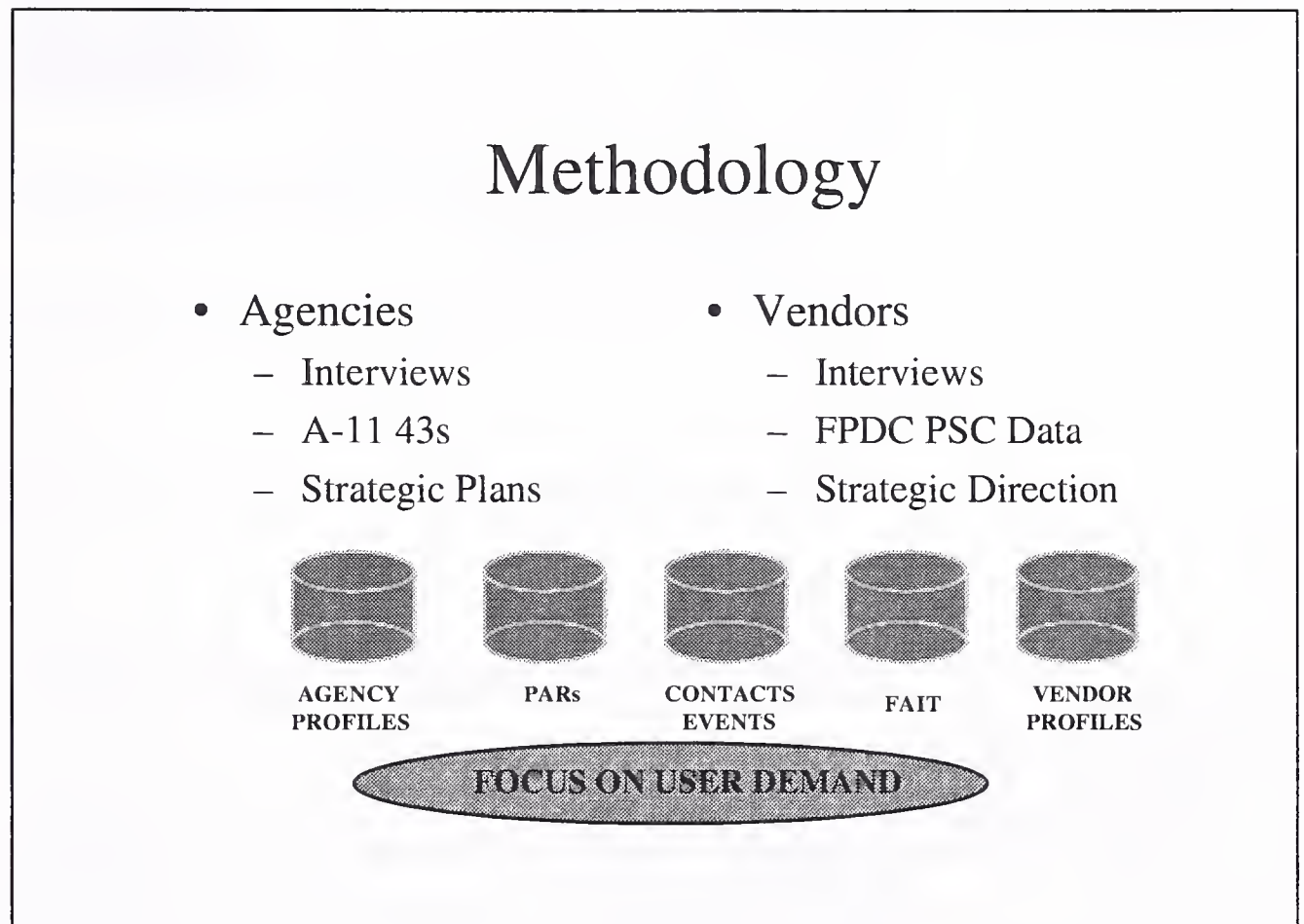
*Source: INPUT*

## C
## Report Organization

In addition to this introduction, this report has been organized as follows:

II.      Executive Summary

III.     Network Computers in the Federal Marketplace

IV.     Market Forecast

V.      Conclusions and Recommendations

Appendices:

A.      Terms and Definitions

B.      Network Computer Equipment

C.      Assessment Criteria

D.      Agency Questionnaire

# D
# Related INPUT Reports

Related current reports from the Electronic Government program of interest to the reader are as follows:

Current Federal Reports

- *Federal Information Systems and Services Market, 1997–2002*

- *Benchmarking of Government Systems Integrators*

- *Y2000 Preparedness and Its Impact on the Federal Government*

- *Impact of Procurement Reform on the Federal IT Market*

- *Evaluation of Federal Program Budgets - 1998*

Commercial Reports

In addition to the federal reports listed, the following commercial reports cover various aspects of the research conducted for this project. Commercial reports are available from a wide range of program choices including Electronic Commerce, Electronic Banking, Enterprise Applications Solutions, Internet/Intranet Technologies and Solutions, Customer Services and Support, Operational Services, and IT Vendor Analysis.

- *Use of Internet Appliances in the Corporation, U.S.*

- *Impact of NCs on Selection of Internet/Intranet Platforms, U.S.*

- *Impact of Network Computers on Banking, U.S. and Europe*

- *Use of Internet Appliances in the Corporation, Europe*

- *Impact of NCs on Selection of Internet/Intranet Platforms, Europe*

# II
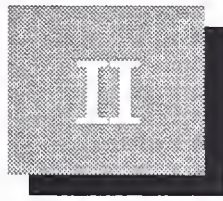
# Executive Summary

## A
## Introduction

Network Computers (NCs) sales are gaining momentum in the commercial market and are predicted to soar in the next few years. After a shaky start, transaction-centric businesses are realizing the benefits of replacing non-programmable terminals and Personal Computers (PCs) with these efficient streamlined devices. Most NC customers report significant savings over using PCs in their first year.

Government agencies are just beginning to explore the potential of NC technology. Several pilots and small-scale NC installations are cropping up across both civilian and defense agencies. The federal market for NCs is expected to lag the commercial market but also experience significant growth.

Although there is demand in the federal environment, NCs will not be an easy sale. The federal market is complex with many factors influencing buying behavior. The government's preference for proven solutions, readily available PC alternatives and other factors will make initial NC sales difficult.

After NCs are established the government represents an enormous opportunity for desktop devices in which NCs will play a major role.

# B
# NC Market Size

Federal NC Opportunity

The Federal NC market represents an enormous NC opportunity due to the huge volumes of workstation equipment the government will buy or replace. The government has many legacy systems with large existing populations of traditional non-programmable terminals, PCs and workstations.

The push to modernize, including providing widespread web access to government workers, streamlining existing operations and new applications, will drive increasing demand for desktop workstations of all types.

Worldwide NC Market Forecast

Worldwide NC sales revenue is estimated to rise from $360 million to $11 billion between 1998 and 2003. This represents a compound annual growth rate (CAGR) of 98%.

Exhibit II-1 shows the growth of estimated worldwide NC sales revenue from 1998 and 2003.

Exhibit II-1

## Worldwide NC Revenue Forecast



Source: INPUT
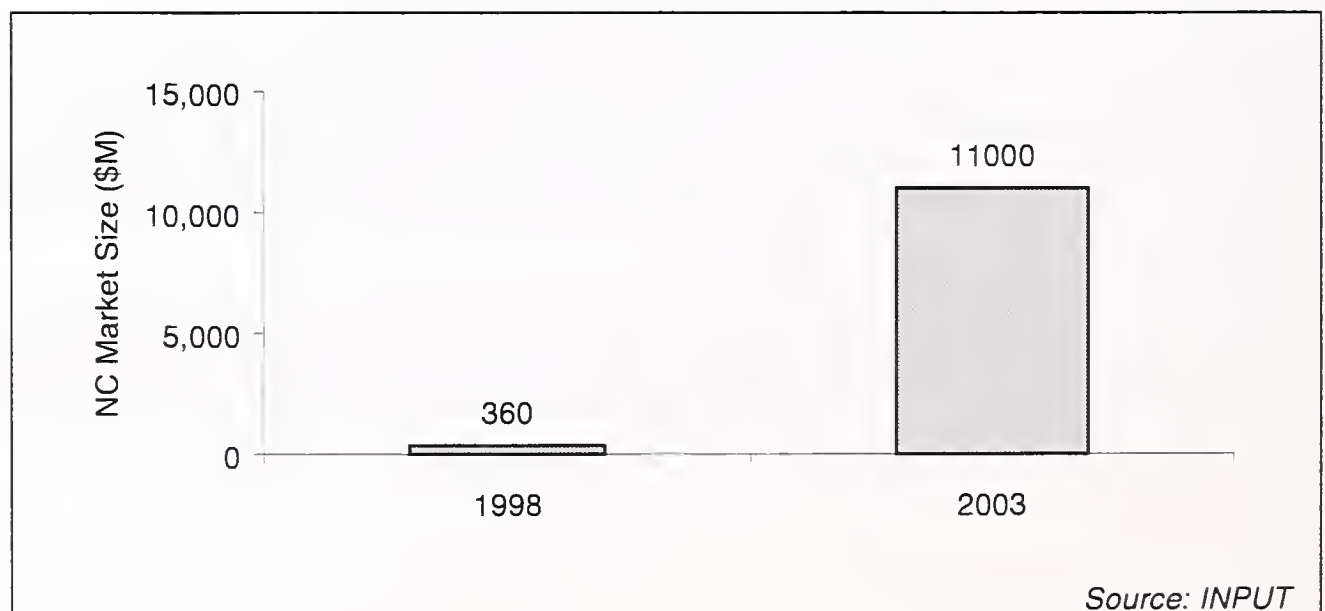
U.S. NC Market Forecast

The U.S. NC market currently represents about 70% of the world market. This will decline over time as Europe and the rest of the world outpaces the U.S. market demand

The U.S. NC market is estimated to be $240 million in 1998 and grow to $5 billion by 2003 with a CAGR of 84%.

Exhibit II-2 shows the forecast for NC revenues from 1998 through 2003.

Exhibit II-2

## U.S. NC Revenue Forecast
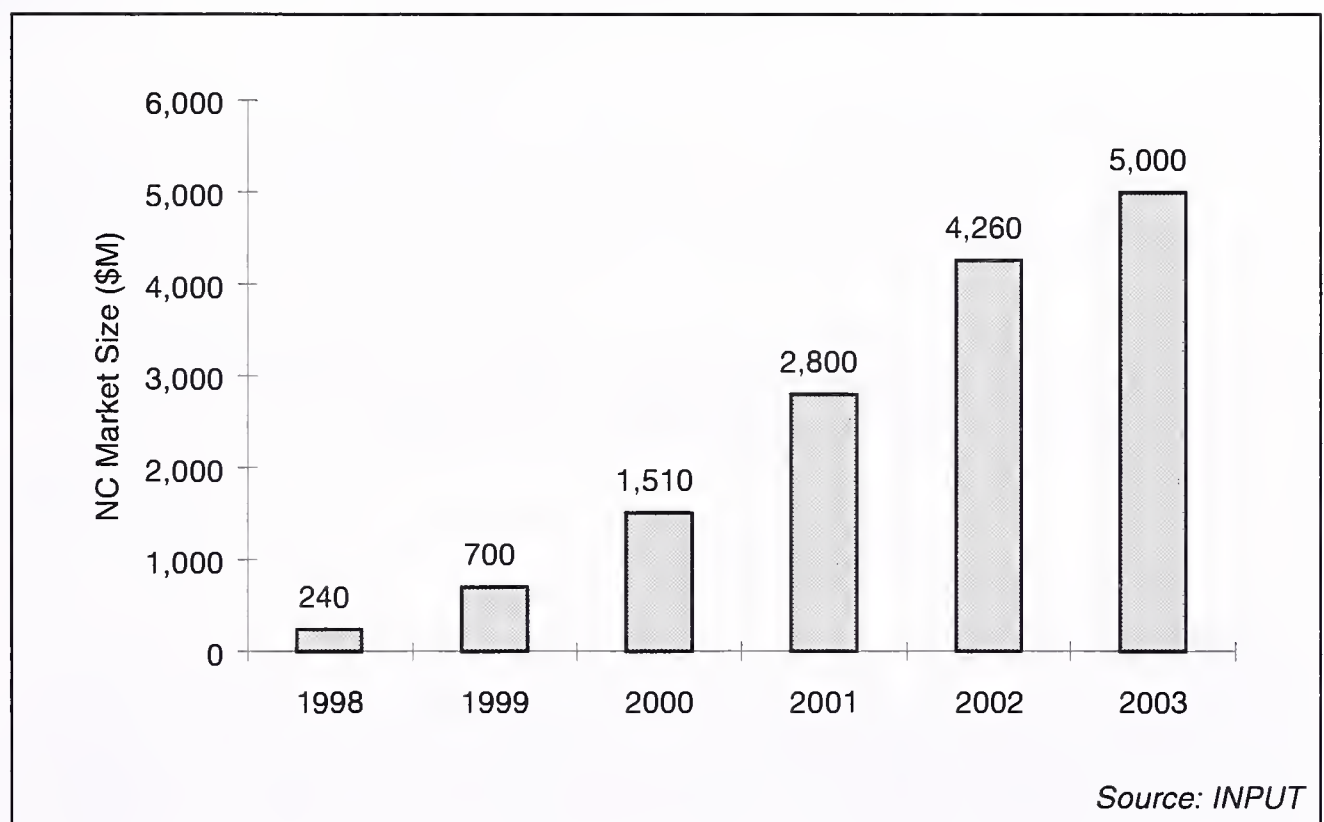


Source: INPUT

Federal NC Market Forecast

The U.S. federal NC market is expected to grow from $12 million in 1998 to $550 million by 2003 with a CAGR of 115%. The slow start in federal sales will be overcome by demand in later years as agencies begin to catch up to the commercial market.

Exhibit II-3 shows the federal NC sales revenue in 1998 and 2003.

Exhibit II-3

## Federal NC Revenue Forecast



Source: INPUT
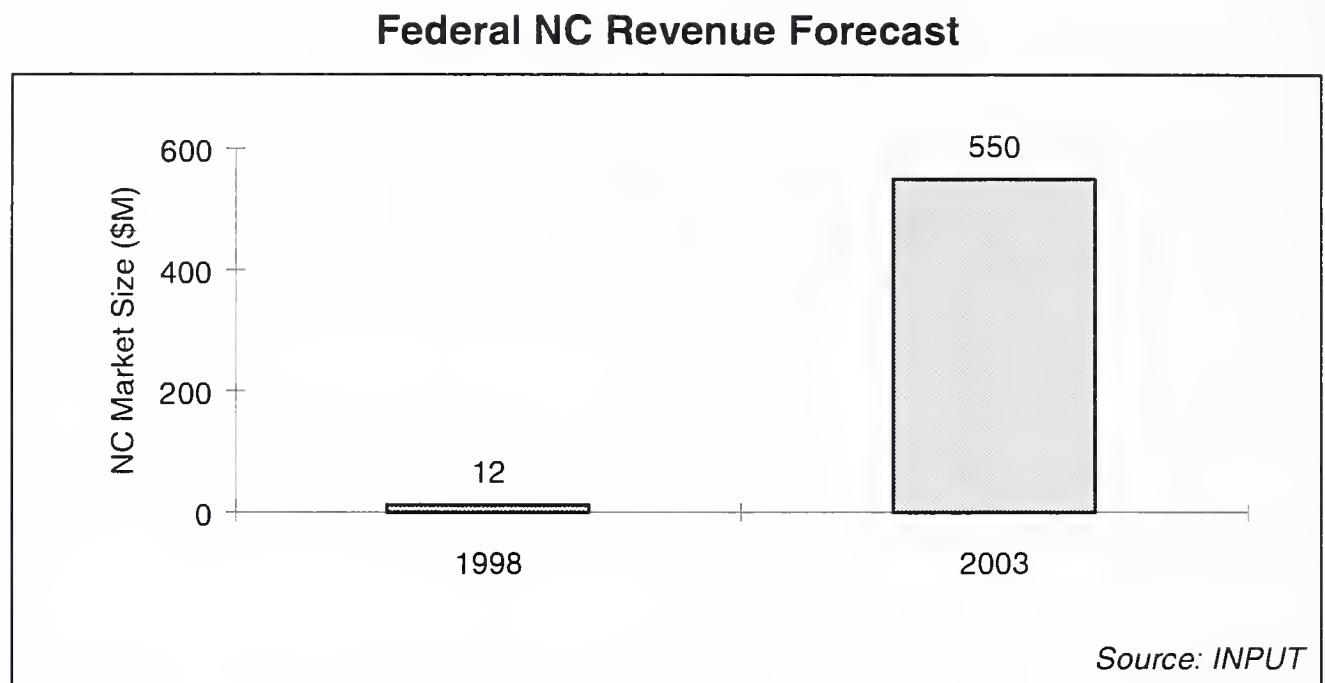
Civilian agencies account for the largest amount of NC spending, representing about 60% of the federal market. Defense agency NC spending will also be significant.

Exhibit II-4 shows the federal NC spending estimates for civilian and defense agencies.

Exhibit II-4

## Federal Network Computer Forecast ($M)

|  | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | FY98-03 CAGR |
|---|---|---|---|---|---|---|---|
| Total Federal | 12 | 42 | 110 | 230 | 413 | 550 | 115% |
| Civilian | 7 | 25 | 67 | 141 | 255 | 341 | 116% |
| Defense | 5 | 17 | 43 | 89 | 158 | 209 | 113% |

Source: INPUT

Both the civilian and defense agencies forecasts show substantial CAGRs over 110%.

# C

# Network Computer Characteristics

Network Computers Defined

NCs physically resemble PCs without diskette and CD-ROM drives that have sealed cases to prevent tampering. Lack of external media storage devices help prevent unauthorized copying of data.

NCs typically operate like a PC but share resources on servers with other users. The shared resource is one of the areas where NCs are very efficient. Data is only resident on the server which also improves data security.

The dependence on server resources often includes software applications, data and processing resource. The server is a central point where software applications are installed, maintained and updated. This centralization removes much of the cost of supporting individual PCs as only the server requires attention.

When used to replace traditional non-programmable terminals, NCs can provide a PC-like interface and run server-based PC and web-enabled applications.

Advantages of Network Computers

The advantage of NCs over non-programmable terminals is primarily the added functionality and flexibility they provide with little incremental cost. The primary advantage of the NC over PCs is the reduction in cost by utilizing central administration. Typical savings reported by NC customers exceed 40% per year over the cost of ownership for PCs.

Benefits of NCs over traditional terminals and PCs are shown in Exhibit II-5.

Exhibit II-5

## NC Benefit Comparison to Terminals and PCs

| Benefits | Network Computers vs. Traditional Terminals | Network Computers vs. Personal Computers |
|---|---|---|
| **Total Cost of Ownership** | NCs have a higher initial cost and similar support costs as traditional terminals but have a higher residual value | Lower cost to purchase, install and support NCs |
| **Ease of Use** | NCs use more intuitive graphical interfaces | NCs less complex |
| **Reliability** | Same | NCs availability dependant on server reliability, more reliable than individual PC's |
| **Centralized Environment** | Same | Much easier and less expensive to upgrade, maintain versions and enforce standards |
| **Security** | Same | NC data and applications on server with less exposure to virus introduction and copying of secure information |
| **Flexibility** | Multiple sessions and multi-tasking, Web enabled, Can use graphical user interface (GUI), ability to customize screens for individual users. | PCs are more flexible and have more functionality |
| **Performance** | Equal host system applications with significantly improved access to the Intranet and other server applications | PCs same with significantly higher associated costs |

*Source: INPUT*

# D

# Federal Marketplace

Overall Federal Environment

Federal agencies are under unprecedented pressure to reduce operating costs while providing improved levels of service. The following is a summary of major forces affecting federal agency IT strategies, direction and spending.

Major overall factors affecting the federal environment include:

- Federal budget constraints

- Effects of downsizing

- Increased demand for services

- Electronic commerce.

Additional factors include:

- The year 2000 will be an issue as funding and resources are diverted to address the problem across the federal government.

- The advent of the digital economy, including the need for Internet access, e-business and e-commerce will continue to be a major driver of government purchases.

- Procurement reform, introduction of federal credit cards and federal digital catalogs has liberalized low-end government purchasing, giving more autonomy to individual agency departments and functional units.

Major initiatives across the government or major agencies include:

- Procurement reform

- Modernization initiatives to best commercial practices

- Electronic information mandates for web-enabled services

- Y2000 compliance

- Audit, accountability and reporting requirements.

Federal IT Environment

NCs are not appropriate for PC replacement in all cases. Knowledge workers performing power-centric processing such as design, analysis, publishing and graphic-intensive modeling are not good candidates for NC installations.

The most viable environment for NC installation is a transaction-centric environment. A large amount of federal IT processing is performed by rank-and-file workers and managers who perform data look-up, data field updates and other transactions.

Due to the amount of public information services, the proportion of transaction-centric workers to knowledge workers is estimated to be greater than that of the commercial sector.

Exhibit II-6 shows the typical attributes of the transaction and power processing environments in the federal sector.

Exhibit II-6

## Federal Client Processing Environment

| Network Computer Transaction Environment | Personal Computer Power Users |
|---|---|
| General Office Workers (75% of workers) | Knowledge Workers (25% of workers) |
| View, Query, Input, Update Information | Create, Publish, Model, Graphics-Intensive, |
| Data Entry, Customer Support, Purchasing, Clerks, Administrators, Sales, Accounting, Accounts Receivable, Point of Sale, Production Workers, Call Centers, Senior Managers, Middle Managers, Supervisors | Graphic Designers, Authors, Programmers, Consultants, Engineers, Scientists, Analysts |

*Source: INPUT*

Windows vs. Java

Windows environments are as commonplace in federal desktop environments as they are in the private sector. Forecasts for the private sector show that Windows-capable machines will outnumber Java-based NCs in total sales over the next 5 years. It is likely that federal NC sales will follow a similar pattern.

Java-based NCs will be the equipment of choice in Unix environments despite Java's ability to perform in other operating environments. Java may improve its position as Java applications become more plentiful and users get more exposure.

## User and Management Attitudes

Many users prefer to have storage, software and other resources on their own PC. Storing such utilities on a NC would represent a loss for some rank-and-file users who would see their personal computer replaced by an impersonal, reduced function NC.

Functional managers and agency administrators have concerns about the complexity of implementing server-based applications and application enablers.

A small percentage of agencies are running pilots or have small installations NCs. However, the bulk of agency officials contacted by INPUT were adopting a "wait and see" attitude until there were large successful NC implementations in major agencies.

The primary benefits sought by agency officials are increased security and savings from lower support costs.

## Federal Procurement Factors

Because NCs require a certain level of systems integration in order to set up the servers and software to be functional, it is unlikely that catalog-type procurement vehicles will be effective until NC systems are pervasive throughout the federal government. Large systems integrators will most likely be the agents of change and introduce NCs to the federal agencies in significant volumes.

Exhibit II-7 shows common federal procurement vehicles and factors that will influence the purchase of NCs.

Exhibit II-7

## Vehicle Factors Affecting NC Procurement

| Procurement Vehicle | Factors Affecting NC Purchases | Comments |
|---|---|---|
| GSA Schedule | No way to purchase a packaged "solution"<br><br>Most appropriate for established equipment base | Not likely to include NCs until they are more prevalent in federal IT |
| BPA | Negotiated from GSA schedule with guaranteed volumes and better pricing<br><br>All agencies can use to purchase | Fee to sponsoring agency |
| GWAC | Typically IDIQ agreement set up with several vendors<br><br>May include direct systems integration support | Not likely to include NCs until they are more prevalent in federal IT |
| Competitive Bid | Federal Request for Proposal typically specifies complete vendor solution including systems integration and ongoing support<br><br>Most likely vehicle to introduce NCs to federal agencies in significant volumes<br><br>Very involved process for both the sponsoring agency and vendor response – used for major procurements and in support of agency-wide initiatives | Vendors may choose an NC solution to be more competitive and improve margins<br><br>Expensive in terms of time and resource |

*Source: INPUT*

A few federal agencies are exploring the concept of seat management, or desktop outsourcing, where desktop workstations are leased from vendors who are responsible for their ongoing management, care, upgrades and maintenance. If seat management becomes popular in federal agencies, users of that service may look to NCs to cut expenses and improve processes.

# E
# Conclusions and Recommendations

The federal government represents a tremendous market potential for NCs but will not be easy to penetrate. There are several inhibitors that NC vendors will need to overcome to sell NCs in the federal market in significant volumes.

Procurement vehicles and established federal IT consultants and systems integrators will play a major role on the introduction of NCs in the federal market.

Success in the federal NC marketplace will go to those NC vendors who take the initiative to overcome the reluctance of federal customers to embrace this technology.

Initiatives that should be considered by NC vendors include:

- Continued product development to make their products easier to install and use

- Widening the scope of existing applications and adhering to open architecture guidelines.

- Be aware of customer wants and needs in order to compete effectively with PC product lines vying for the same customers.

- Invest in NC promotion including educating federal clients, promote enhancements and advances and show the true benefits of NC installations to drive demand.

- Ensure that there is a crisply defined value proposition for their products.

Part of the value proposition should address the top two NC benefits of interest to federal agencies. The agencies contacted by INPUT indicated their interest in NC technology was to lower overall total cost of ownership (TCO) and improve security. The vendors should be able to demonstrate the security advantages and provide a method for agencies to calculate cost of ownership vs. PCs as part of their communications campaign.

Both commercial and federal reference accounts are necessary to provide credibility to the NC as a viable large-scale solution in the federal environment.

Business alliances and partnerships should be fostered by NC vendors with top federal systems integrators to incorporate NC product into future proposals.

## III
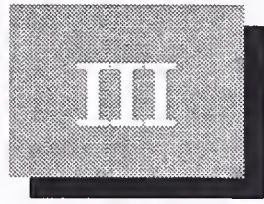
# Network Computers in the Federal Marketplace

Federal Agencies are just beginning to investigate the potential for network computers (NCs). Federal IT administrators are not at all convinced that the NC is right for their systems. Although NCs are not appropriate for all applications, a number of compelling reasons make NCs a good match for many federal government computer operations.

Factors that need to be examined include overall market forces, federal initiatives, and needs for increased productivity and controls in an environment of resource and budget constraints. Other factors affecting the decision to incorporate network computers into federal IT environments include confusion about rival NC architectures, misconceptions concerning wholesale PC replacement, increased autonomy of agency departments, concerns about additional server load and administration and the unrealized potential of the NC in the commercial marketplace.

The following sections provide an overview of the NC, forces driving federal IT requirements and how the NC fits in the federal IT environment.

## A

## Network Computer Overview

What Are Network Computers?

This study focuses on the class of network computer devices that attach to business networks and are used as individual user stations. There is a class of consumer network computer devices commonly referred to as Internet appliances such as web-enabled televisions, communication-enhanced lighting and environmental controls and other "smart" appliances. Internet appliances are excluded for purposes of this study.

NCs are limited-feature network-connected client computers designed to provide much of the functionality of Personal Computers (PCs) with shared server resources. Typically NCs lack common PC features such as disk drives and other storage devices and sometimes have less processor power.  NCs are usually less expensive than PCs with significant lower support costs.

Physically, NCs resemble PCs except they do not have familiar features like diskette and CD-ROM drives and their cases are usually sealed to prevent tampering.

NCs share many of the advantages inherent to traditional non-programmable terminals such as lower costs, central administration and better security features.  Unlike traditional terminals, NCs can provide a PC-like interface and run server-based PC and web-enabled applications.

Since NCs gain their efficiencies by sharing resources on servers, client/server architecture figures predominantly in NC installations. *Client/server* is a network architecture where each computer in the network is either an individual user workstation called a *client* or a computer called a *server* that is dedicated to managing a network resource such as disk drives, printers or network traffic or provide processing power.

Most NC vendors advocate the use of traditional 3-tier client/server architecture consisting of network-managed clients, application servers and data servers.

There are several types of NCs which are referred to by different names in popular use. For example, *thin client* is a class of client/server software applications designed so the majority of the data processing is performed by the server.  *Thin client* is also commonly used to refer to network computers without disk drives designed to serve as the client computer in client/server architectures.  Conversely, a *fat client* refers to a client computer with a hard disk drive.

Evolution of Network Computers

At their inception, NCs did not have a universal industry-wide standard and there are at least two conflicting notions as to how NCs should function; Netscape and Sun Microsystems advocate using Java-based, thin client applications that run on the server, Intel and Microsoft advocate processing large Windows-based applications locally on the computer, and others are seeking the middle ground with hybrid machines capable of both functions.

In early 1996, Apple, IBM, Oracle, Sun and Netscape announced the results of a joint initiative called NC Reference Profile 1. This de facto standard outlines a common set of guidelines governing standard features and functions across a broad range of scalable NCs. These guidelines specify web-enabled Java machines that run TCP/IP and use Simple Network Management Protocol for central administration. Provisions for running Windows were not included in these guidelines and limited processing was required for these Java-based machines.

By October 1996, Microsoft and Intel launched development of the NetPC which was a sealed PC without diskette or CD-ROM drives with NC features such as remote-boot, central administration. The NetPC has provisions for an internal hard disk for cache storage to improve performance. The NetPC was designed to process Windows applications run from the server.

In another initiative at the end of 1997, Intel released Lean Client System Design Guidelines. These guidelines were developed in conjunction with NC manufacturers and provide specifications for development of operating systems and other software necessary for NCs incorporating Intel processors.

The initial thrust of the NC market was to displace PCs and create a new application environment based on Java. This has yet to occur and the pervasive application environment remains mostly Windows-based. The changes required in application architecture and unknown application availability have prompted many potential users to wait rather than embrace this technology.

A number of software solutions were developed to allow customers to install NCs and retain their windows applications, now running on the server. Current software solutions include:

- Applications - Windows Terminal Server Edition software by Microsoft

- Application enablers – Metaframe by Citrix Systems, Inc.

- Intelligent Console Architecture (ICA) by Citrix Systems, Inc.

NC vendors were quick to recognize the market for providing cost-effective front ends for legacy and server-based Windows applications and many provide combination machines that are both Java and Windows capable. It was also obvious that platform and operating system compatibility issues needed to be addressed for the NC to be a success.

Currently, there have been a number of announcements from NC vendors of joint efforts to reduce complexity and improve the functional capability and interoperability of NCs. These include:

- Expansion of leading application enabler and network administration software to work on a variety of platforms and operating systems

- Enhancements to Java operating systems and environment

- Offering incentives to independent software developers to develop more Java applications

- Establishing reference specifications and standards for mobile networks, smart cards and other emerging technologies

- Expanding cabling options – i.e. allow customers to use existing twinax cables

- Simplifying printing solutions

- Full Year 2000 compliance.

Despite a slow start, NC hardware and software vendors are rapidly making inroads in the commercial marketplace. Commercial clients across all industries are installing NCs to control costs, improve controls and increase productivity.

The future is bright for NCs. The commercial forecast for network computers shows an explosion in NCs with anticipated compound annual growth rate (CAGR) of well over 100% from 1997 through 2002.

Advantages of Network Computers

The advantage of NCs over non-programmable terminals is primarily the added functionality and flexibility they provide with little incremental cost. NCs can run legacy applications and additionally provide access to the web, run PC-like applications from the server, and retain the central control and security aspects of traditional terminals.

The primary advantage of the NC over PCs is the reduction in cost by utilizing central administration. Typical savings reported by NC customers exceed 40% per year over the cost of ownership for PCs. This includes cost and speed of software changes, version control, added security due to including better data integrity and backup capability and the lack of disk drives on client computers which serves to discourage copying sensitive data.

Significant inroads are being made by NCs as replacements for older technology traditional terminals and as a viable alternative to the ongoing effort and expense in maintaining and controlling large population of PCs. Benefits of NCs over traditional terminals and PCs are shown in Exhibit III-1.

Exhibit III-1

## NC Benefit Comparison to Terminals and PCs

| Benefits | Network Computers vs. Traditional Terminals | Network Computers vs. Personal Computers |
|---|---|---|
| **Total Cost of Ownership** | NCs have a higher initial cost and similar support costs as traditional terminals but have a higher residual value | Lower cost to purchase, install and support NCs |
| **Ease of Use** | NCs use more intuitive graphical interface | NCs less complex |
| **Reliability** | Same | NCs availability dependant on server reliability, more reliable than individual PC's |
| **Centralized Environment** | Same | Much easier and less expensive to upgrade, maintain versions and enforce standards |
| **Security** | Same | NC data and applications on server with less exposure to virus introduction and copying of secure information |
| **Flexibility** | Multiple sessions and multi-tasking, Web enabled, Can use graphical user interface (GUI), ability to customize screens for individual users. | PCs are more flexible and have more functionality |
| **Performance** | Equal host system applications with significantly improved access to the Intranet and other server applications | PCs same with significantly higher associated costs |

*Source: INPUT*

As lower cost NCs are achieving more popularity and are cutting into the PC market, PC vendors are reacting to this threat by offering low priced models and incorporating NC-like network management features and capabilities into PCs. The NC and PC lines will continue to converge over time.

Client Processing Environment

NCs are not appropriate as wholesale replacements for PCs. Although there are greater economies of scale to be realized in larger enterprise installations, a large number of smaller businesses have installed NCs and are realizing savings and other advantages. The way the machine is used is key to whether a NC is a desirable alternative.

The NC is most viable for a transaction environment where the processing needs are primarily to query, view and update information. Transaction processing is typical of the general office worker that makes up approximately 70% of the workforce population.

Personal Computers and workstations are more appropriate for use in a power environment that entails creating, publishing, modeling and graphic-intensive processing. Power processing is typical of the knowledge worker that makes up approximately 30% of the workforce population.

Exhibit III-2 shows the typical attributes of the transaction and power processing environments.

Exhibit III-2

## General Client Processing Environment

| Network Computer Transaction Environment | Personal Computer Power Users |
|---|---|
| General Office Workers (70% of workers) | Knowledge Workers (30% of workers) |
| View, Query, Input, Update Information | Create, Publish, Model, Graphics-Intensive, |
| Data Entry, Customer Support, Purchasing, Clerks, Administrators, Sales, Accounting, Accounts Receivable, Point of Sale, Production Workers, Call Centers, Senior Managers, Middle Managers, Supervisors | Graphic Designers, Authors, Programmers, Consultants, Engineers, Scientists, Analysts |

*Source: INPUT*

Enterprises are redefining business processes can often find NC solutions to be an expedient way to introduce changes quickly. For example, installing an application on an individual machine basis for a large network means the software must be individually installed on each machine. This process can be streamlined if the applications can be installed on the servers, often across the network.

Compatibility of existing software applications should be examined when considering NC installations. Other considerations for NC implementations include additional network and server overhead as well as the additional server administration.

# B
# Federal Marketplace

Overall Federal Environment

The overall market forces operating in the federal marketplace has a profound effect on the direction and strategy of federal IT departments. These overall factors play a part in what IT solutions will be pervasive and successful in the next few years.

With the political realities of defense reduction, the Balanced Budget Amendment, modernization and reform, federal agencies are under unprecedented pressure to reduce operating costs while providing improved levels of service. Although sizable budgetary support from Congress for IT systems, equipment and services will continue, the forecasts show modest but steady growth through the foreseeable future.

Restructuring will continue, especially in civilian agencies, causing shortages of IT skills and resources within the government and increasing dependence on outside vendor resources. Agencies will do more outsourcing and increase emphasis and dependence on efficiencies gained through IT solutions. Business process reengineering and enterprise applications are also playing more of a role in federal agencies, as is electronic commerce.

Overall, major factors affecting agency behavior include:

- Federal budget constraints

- Effects of downsizing

- Increased demand for services

- Electronic commerce.

Year 2000 issues will consume government resource and divert IT spending to address those issues across the federal government.

The advent of electronic business and electronic commerce has required the government to invest in the electronic infrastructure and business process changes for procurement support. The Internet has stimulated even higher citizen demand for government services resulting in government mandates and initiatives to host web sites and access for providing cyber-services and information at every level.

At the same time, procurement reform, and introduction of federal credit cards and federal digital catalogs has liberalized low end government purchasing and given more autonomy to individual agency departments and functional units.

The government has put forth several major initiatives to address these issues in a consistent manner. These initiatives provide guidance to provide common direction across the government or agency. Each of these initiatives have a profound effect on agency direction, IT strategy and buying behavior.

Major initiatives across the government or major agencies include:

- Procurement reform

- Modernization initiatives to best commercial practice

- Electronic information mandates for web-enabled services

- Y2000 compliance

- Audit, accountability and reporting requirements.

Vendors of IT solutions to the federal government will be most successful if they are able to position their solutions to address or complement these major factors and initiatives.

Federal IT Environment

The federal government uses a wide range of IT technology including scientific graphics, programming, modeling-intensive weather and mapping applications and complex weapons and logistical systems to name a few. The federal government is the largest publisher in the world. There are a significant number of knowledge workers in the government who utilize power-computing applications. However, the vast majority of federal IT processing is transaction processing rather than power computing.

A large amount of federal IT processing is performed by rank-and-file workers and managers who perform data look-up, data field updates and other transactions that play to the strengths and efficiencies of NC implementation. Due to amount of public information services, the proportion of general office workers to knowledge workers is estimated to be greater than that of the commercial sector.

Exhibit III-3 shows the typical attributes of the transaction and power processing environments in the federal sector.

Exhibit III-3

## Federal Client Processing Environment

| Network Computer Transaction Environment | Personal Computer Power Users |
|---|---|
| General Office Workers (75% of workers) | Knowledge Workers (25% of workers) |
| View, Query, Input, Update Information | Create, Publish, Model, Graphics-Intensive, |
| Data Entry, Customer Support, Purchasing, Clerks, Administrators, Sales, Accounting, Accounts Receivable, Point of Sale, Production Workers, Call Centers, Senior Managers, Middle Managers, Supervisors | Graphic Designers, Authors, Programmers, Consultants, Engineers, Scientists, Analysts |

*Source: INPUT*

Federal agencies are increasing use of public service equipment such as kiosks and public access terminals which are also prime candidates for NC installations.

Web-enabled applications are in increasing demand among the federal general office population to access, retrieve and update information on Internet and electronic commerce applications.

Several federal agencies are undergoing or considering reengineering their business processes. There is a federal initiative to drive upgrading agency IT operations to the level of best commercial practice. Interest in enterprise computing applications such as agency-wide relational database applications, enterprise resource planning, knowledge-based business applications and electronic commerce applications will provide yet another opening for NC applications.

Individual User Bias

Many individual users find the prospect of having their desktop PC replaced by a NC to be daunting. Besides the expected resistance to change, there is a sense of proprietorship with having autonomous control of their own computer. Increased reliance on unseen network resources is unsettling.

Many users prefer to have storage, software and other resources on their own PC. For many rank-and-file workers, replacement of their personal computer by an impersonal, reduced function NC seems to represent a loss.

Much of this individual bias stems from confusion about the nature of NCs and their capabilities. Traditional terminal users would see an immediate improvement in the interface and capabilities of their workstation. Properly configured NC implementations rival the performance of many PC applications without the problems of version control and interdepartmental application compatibility issues.

Management Attitudes

Functional managers and agency administrators are leery about the complexity of implementing server-based applications and application enablers. The prospect of Java environments and even familiar Windows applications via application enablers adds another level of complexity to an already onerous network management environment.

A full 40% of government agencies contacted had not considered network computers, whereas the bulk of those contacted were adopting a "wait and see" attitude until there were large successful NC implementations in a couple of major agencies.

There were a small percentage of agencies that were running pilots with small numbers of NCs to do side-by-side comparisons with PC terminals.

The agency officials who were actively considering NCs are primarily interested in increased security, savings from lower support costs, and savings and improved controls for computer and software assets.

Preliminary results from existing pilots have been very positive.

Federal Procurement Factors

The rate of change and complexity of technology has increased in recent years causing frustration among IT managers struggling to keep abreast with increasingly meager resources. This is especially true in the federal environment that not only has to contend with budgetary constraints and shrinking technical resources, but a lengthy procurement process. Government agency preference for proven technologies coupled with long procurement cycles often result in solutions that are obsolete before they are completely implemented.

Recent procurement reform has made inroads in speeding up and reducing the expense of the procurement process by introducing new vehicles to make it easier and more efficient for the government to purchase goods and services. The creation of GSA schedule based electronic catalogs and proliferation of federal IMPAC credit cards (International Merchant Purchase Authorization Card) has contributed to the autonomy of agency departments and functional units. Government workers and purchasing agents have a wide selection of purchasing vehicles to satisfy their needs.

How the government procures equipment will have a profound affect on the speed and amount of penetration of NCs in the federal market. The appeal of less expensive ongoing support costs may be negated for the purchasing agent that has to consider the time, procurement costs, fees and complexities of participating in a competitive bid and integration effort. This is especially true compared to the ease of buying PCs from an existing purchasing vehicle.

NCs require a certain amount of systems integration to set up the appropriate server and application support. They are most effective in cases where the business processes are designed specifically to take advantage of the NC's unique benefits. This overall solution approach is typical of competitive bid contracts.

It is unlikely that NCs will be initially purchased from vehicles such as the GSA schedule, Government-Wide Acquisition Contracts (GWACs) , or Blanket Purchase Agreements BPAs until there are established NC installations. The net effect is that the introduction of NCs in many departments will be slowed.

Large systems integrators will undoubtedly introduce NC installations as part of their IT solutions in competitive bids. Although government RFPs are not specifying NC solutions, the efficiencies and support cost savings

will make NCs a competitive choice for integrators responsible for ongoing support and operating on slim margins. Once NCs have a substantial foothold in major agencies, other agencies will follow suit and NCs will start to appear in general purchasing vehicles.

Exhibit III-4 shows common federal procurement vehicles and factors that will influence their use to purchase NCs.

Exhibit III-4

## Vehicle Factors Affecting NC Procurement

| Procurement Vehicle | Factors Affecting NC Purchases | Comments |
|---|---|---|
| **GSA Schedule** | No way to purchase a packaged solution<br><br>Most appropriate for established equipment base | Not likely to include NCs until they are more prevalent in federal IT |
| **BPA** | Negotiated from GSA schedule with guaranteed volumes and better pricing<br><br>All agencies can use to purchase | Fee to sponsoring agency |
| **GWAC** | Typically IDIQ agreement set up with several vendors<br><br>May include direct systems integration support | Not likely to include NCs until they are more prevalent in federal IT |
| **Competitive Bid** | Federal Request for Proposal typically specifies complete vendor solution including systems integration and ongoing support<br><br>Most likely vehicle to introduce NCs to federal agencies in significant volumes<br><br>Very involved process for both the sponsoring agency and vendor response – used for major procurements and in support of agency-wide initiatives | Vendors may choose an NC solution to be more competitive and improve margins<br><br>Expensive in terms of time and resource |

*Source: INPUT*

Federal initiatives can also have a large role in purchasing patterns. There are currently seat management initiatives in a few agencies that encourage the outsourcing of desktop equipment and support services. The government contracts for a number of "seats" and a vendor supplies appropriate equipment, desktop management and support. The vendors for these contracts may opt to introduce NCs where appropriate to cut their operating expense, improve their competitiveness and improve their margins.

GSA awarded a $9 billion Seat Management contract on July 1, 1998 following Navy's award of the $13 billion Lease of Information Technology Components contract in January and the award of the $13 billion Outsourcing Desktop Initiative for NASA (ODIN) contract in June of this year.

As NC installations are accepted as a proven technology by the government, we may see agency or government-wide initiatives mandating their use.

**IV**
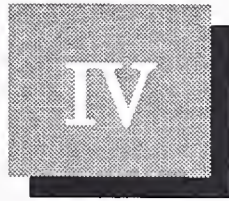
# Market Forecast

After a lean beginning, network computers (NCs) have just begun to realize appreciable sales in the private sector but have yet to fulfill the heights expected by their proponents. Despite modest initial sales, NCs addresses network station management problems that are fundamental to every network installation. The NC is gaining momentum in the commercial market and sales are expected to increase dramatically over the next few years.

The federal market for NCs is expected to lag behind the commercial market but also experience significant growth. Initial NC installations in major agencies will undoubtedly be driven by systems integrators seeking competitive and efficient network solutions.

After NCs are established, the government has an enormous potential for new and replacement equipment for terminals, PCs, and workstations as well as special applications such as limited-function terminals and kiosks.

## A
## Federal Market Potential

### Federal NC Opportunity

A large number of legacy systems still operate in the federal government with a significant population of traditional non-programmable terminals, PCs and workstations. Many of these systems are slated for modernization and represent vast opportunities for NC installation. The trend to migrate to distributed systems is continuing. Year 2000 issues will be another driving factor prompting modernization including system and equipment replacement.

There have been over 270 awarded government contracts with significant desktop content since 1990 with an overall value of nearly $100 billion and over $15 billion of active procurements. Although a large portion of

these contracts represent spending on other than terminals, PCs and workstations, it is a good indication of continued government spending on this class of equipment.

Exhibit IV-1 shows procurement activity with significant network desktop content by agency. The overall spending for civilian agencies at $80 billion is well over twice the $34 billion spent by defense agencies.

Exhibit IV-1

## Federal Network Workstation Procurements 1990 –1998

| Agency | Awarded | | Active | | Total | |
|---|---|---|---|---|---|---|
| | Programs | Value | Programs | Value | Programs | Value |
| Air Force | 22 | 5,010 | 4 | 1,615 | 26 | 6,625 |
| Army | 38 | 17,658 | 10 | 925 | 48 | 18,583 |
| Navy | 22 | 5,079 | 4 | 314 | 26 | 5,393 |
| Defense | 34 | 3,777 | 2 | 16 | 36 | 3,793 |
| **TOTAL DoD** | **116** | **31,524** | **20** | **2,870** | **136** | **34,394** |
| Commerce | 8 | 106 | 2 | 41 | 10 | 147 |
| Energy | 5 | 428 | 2 | 258 | 7 | 686 |
| GSA | 6 | 9,557 | 1 | 13 | 7 | 9,570 |
| Hlth & Human Res. | 19 | 5,355 | 2 | 48 | 21 | 5,403 |
| Justice | 22 | 3,449 | 1 | 200 | 23 | 3,649 |
| NASA | 21 | 31,118 | 4 | 1,965 | 25 | 33,083 |
| Postal | 4 | 254 | 1 | 200 | 5 | 454 |
| Social Security | 6 | 157 | 1 | 1 | 7 | 158 |
| State | 5 | 417 | 0 | 0 | 5 | 417 |
| Transportation | 24 | 2,780 | 5 | 10,376 | 29 | 13,156 |
| Treasury | 13 | 9,842 | 3 | 27 | 16 | 9,869 |
| U.S. Courts | 4 | 297 | 1 | 15 | 5 | 312 |
| Other | 18 | 3,204 | 3 | 52 | 21 | 3,256 |
| **Total Civilian** | **155** | **66,964** | **26** | **13,196** | **181** | **80,160** |
| **Total Federal** | **271** | **98,488** | **46** | **16,066** | **317** | **114,554** |

*Source: INPUT*

Awarded Federal Contracts

Some examples of large-scale, recently awarded federal contracts with significant PC and workstation content include:

Program:  Common Hardware/Software II
Department: Army, CECOM
Incumbent: GTE
Date: 4/10/95
Value:  $20 million

Program:  Seat Management
Department: GSA
Incumbent: Multiple
Date: 7/1/98

Program:  NIH Electronic Computer Store II
Department: Health and Human Services
Incumbent: Multiple
Date: 9/30/97

Program:  Scientific and Engineering Workstation Procurement II (SEWP II)
Department: NASA
Incumbent: Multiple
Date: 9/30/96

Program:  Outsourcing Desktop Initiative for NASA (ODIN)
Department: NASA
Incumbent: Multiple
Date: 6/18/98

Program:  CAD/CAM II
Department: Navy, NAVCOM
Incumbent: Intergraph
Date: 7/13/94
Value:  $400 million

Program:  Document Processing System
Department: Treasury
Incumbent: IBM
Date: 2/28/94
Value:  $1.3 billion

Program: Treasury Distributed Processing Infrastructure
Department: Treasury
Incumbent: Multiple
Date: 7/18/97

Program: Procurement of Computer Hardware and Software
Department: Veterans Affairs
Incumbent: Digital Equipment Corporation, Vanstar
Date: 1/14/97
Value: $1.5 billion

Active Federal Procurements

Some examples of active federal procurements with significant network workstation content include:

Program: National Training Center Objective Instrumentation System
Department: Army, STRICOM
RFP Date: 6/15/99
Est. Value: $500 million

Program: Automatic Identification Technologies II
Department: Army, CAC-W
RFP Date: 10/10/98
Est. Value: $211 million

Program: PTO Desktop Computer
Department: Commerce, PTO
RFP Date: 1/15/99
Est. Value: $170 million

Program: Operations Automatic Data Processing
Department: NASA, JSC
RFP Date: 5/1/02
Est. Value: $200 million

Program: Scientific and Engineering Workstation Procurement III (SEWP III)
Department: NASA
RFP Date: 9/15/99
Est. Value: $1.8 billion

Program: National Departure Sequencing Program
Department: Transportation, FAA
RFP Date: 10/15/98
Est. Value: $125 million

Program:  Standard Workstation IV Contract (SW IV)
Department: Transportation, USCG
RFP Date: 7/15/99
Est. Value:  $188 million

These contracts present an opportunity for federal network computer vendors.  The key will be to market the NC to such an extent that it might be considered instead of a workstation on some of these initiatives.

# B

## Network Computer Forecast

Worldwide NC Market Forecast

The worldwide market for NCs is relatively small in 1998 but expected to experience phenomenal growth over the next 5 years.  NC revenue is estimated to grow from $360 million to a  $11 billion between 1998 and 2003.  This represents a compound annual growth rate (CAGR) of 98%.

This phenomenal growth is attributed to the continued explosion in private and public networks, replacement of traditional terminals and limited application PCs and worldwide demand as worldwide market forces continue to drive the need for network solutions.

Exhibit IV-2 compares estimated worldwide NC sales revenue from 1998 to those forecasted for 2003.

Exhibit IV-2

### Worldwide NC Revenue Forecast



Source: INPUT
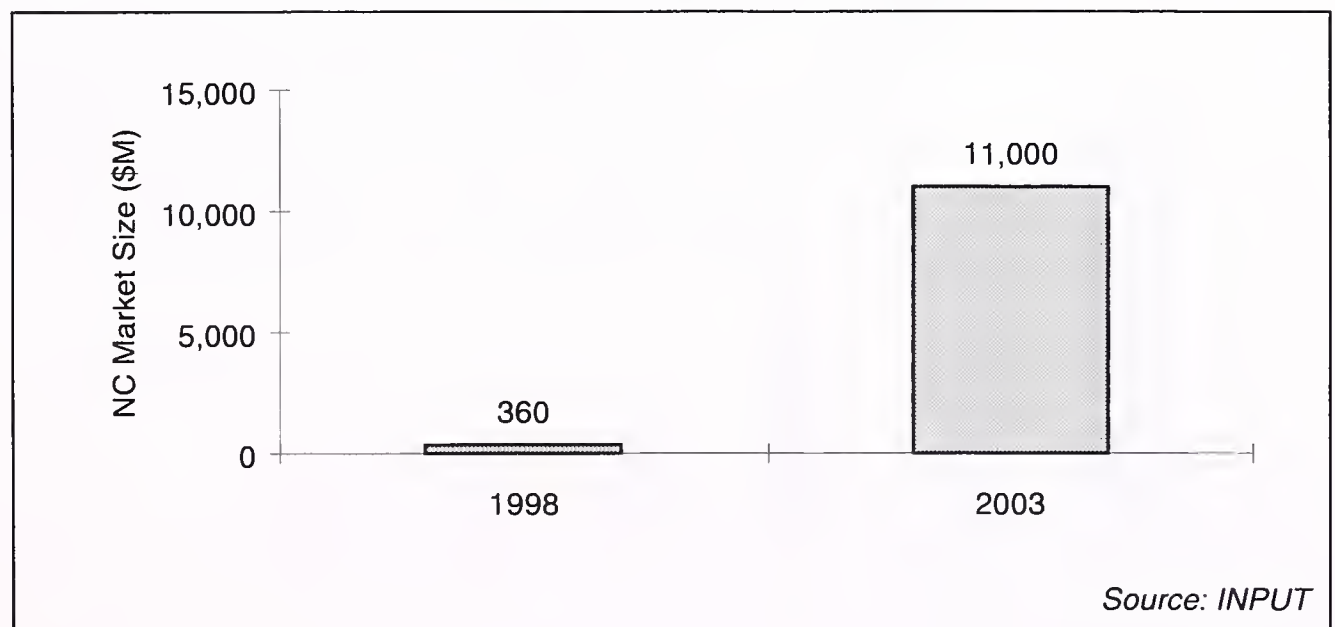
Worldwide shipments of NCs are expected to grow from 530,000 units to almost 26 million units between 1998 and 2003. Exhibit IV-3 shows the worldwide NC shipment forecast.

Exhibit IV-3

## Worldwide NC Shipments Forecast



Source: INPUT
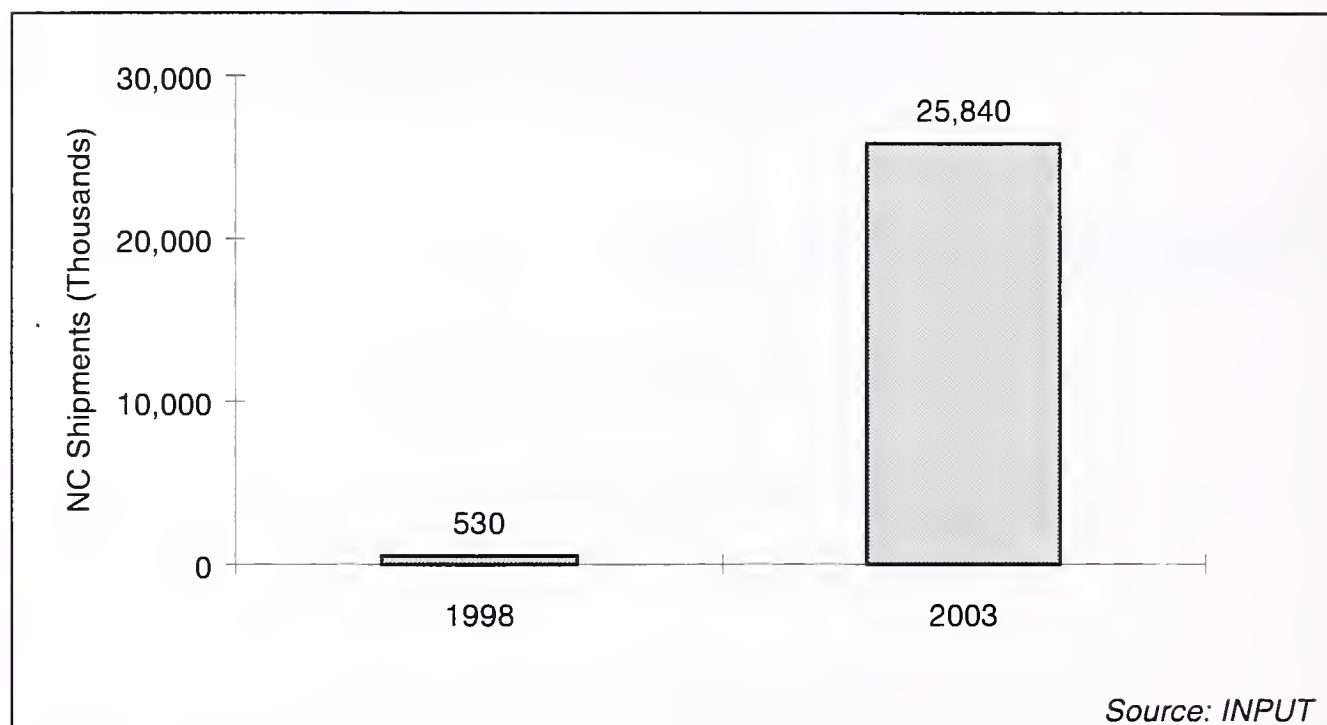
### U.S. NC Market Forecast

The U.S. NC market is forecasted to start from a modest $240 million in 1998 and grow to an impressive $5 billion by 2003. This represents a CAGR of 84%.

The U.S. NC market currently accounts for almost 70% of the worldwide market. As sales in Europe and the rest of the world increase, the proportion of U.S. sales is expected to shrink to 45% by 2003. Overall, U.S. NC sales will average 56% of the worldwide market over the next 5 years. Declining NC unit prices and slowing demand will allow sales in the rest of the world to outpace U.S. NC sales.

Exhibit IV-4 shows the year-by-year forecast for NC revenues from 1998 through 2003.

Exhibit IV-4

## U.S. NC Revenue Forecast



Source: INPUT
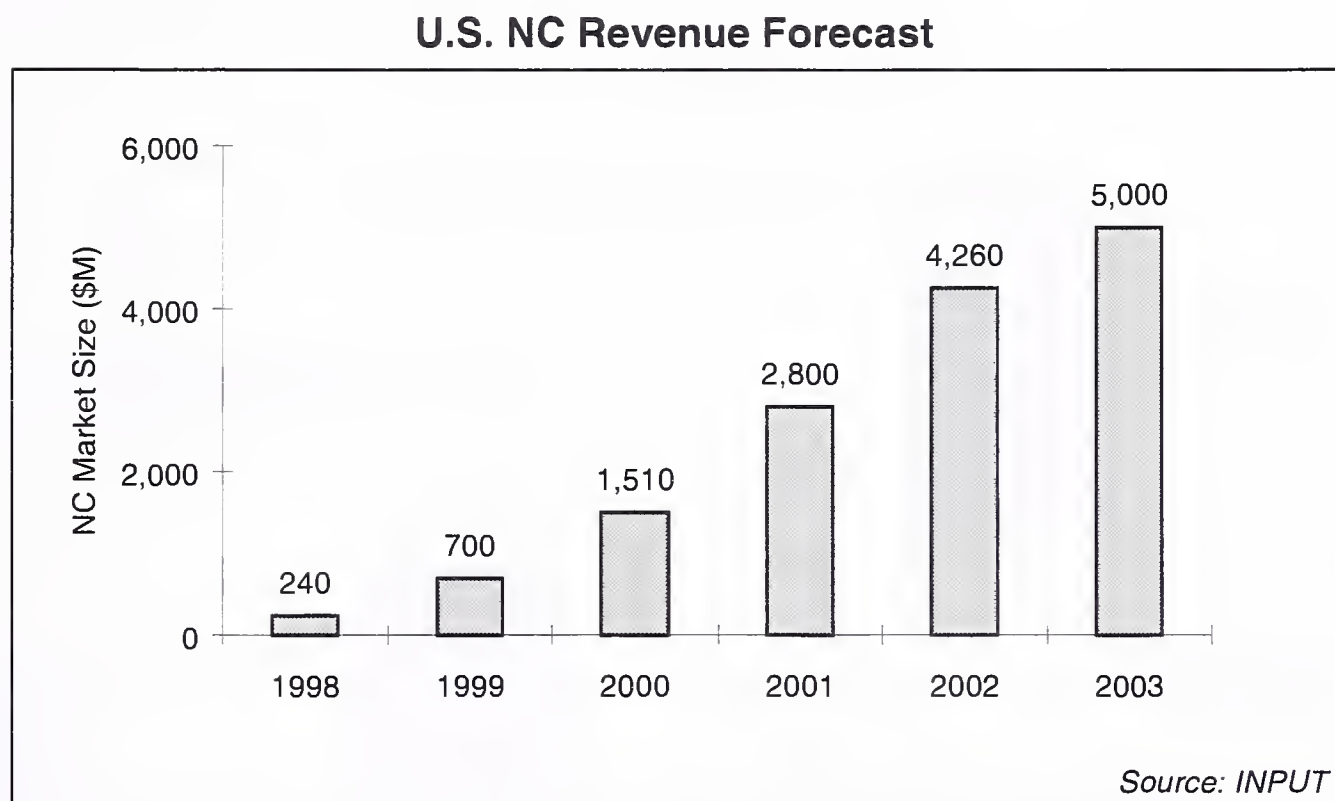
NC shipments for the U.S. are expected to grow from 370,000 units in 1998 to almost 11.8 million units by 2003. Exhibit IV-5 shows the U.S. NC shipment forecast

Exhibit IV-5

## U.S. NC Shipments Forecast



Source: INPUT
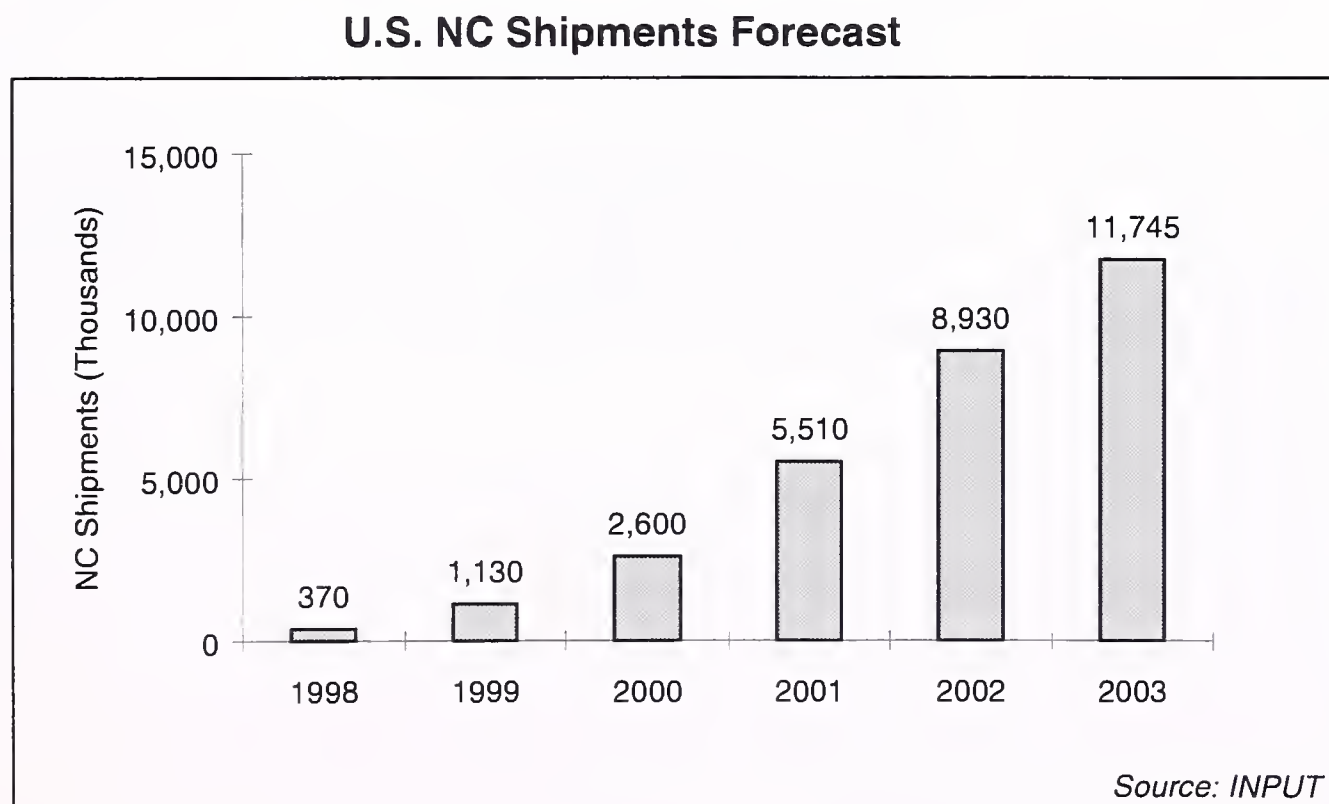
Average NC Prices

The average NC per unit price is dropping over time. If price-cutting becomes the norm, the NC will be treated as a commodity and would most likely result in increased volumes as well as negatively impacting NC vendor revenues.

Exhibit IV-6 shows a comparison of estimated average unit price for 1998 to the average unit price in 2003.

Exhibit IV-6
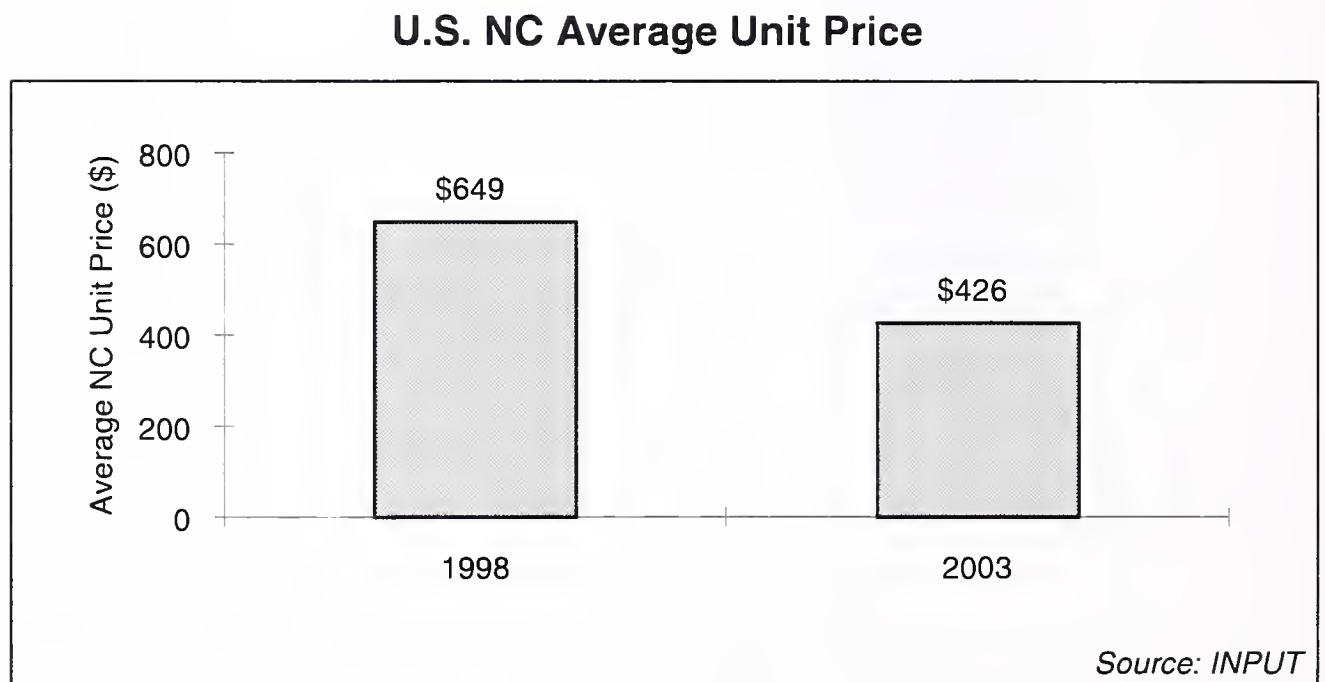
## U.S. NC Average Unit Price



Source: INPUT

Federal NC Market Forecast

The U.S. federal NC market is expected to grow from $12 million in 1998 to a respectable $550 million by 2003 with a CAGR of 115% which is greater than overall U.S. market growth.  The slow start in federal sales is attributed to initial attitudes of distrust of NC technology and the onerous realities of federal procurement.

Exhibit IV-7 compares estimated federal NC sales revenue from 1998 to those forecasted for 2003.

Exhibit IV-7

## Federal NC Revenue Forecast



Source: INPUT
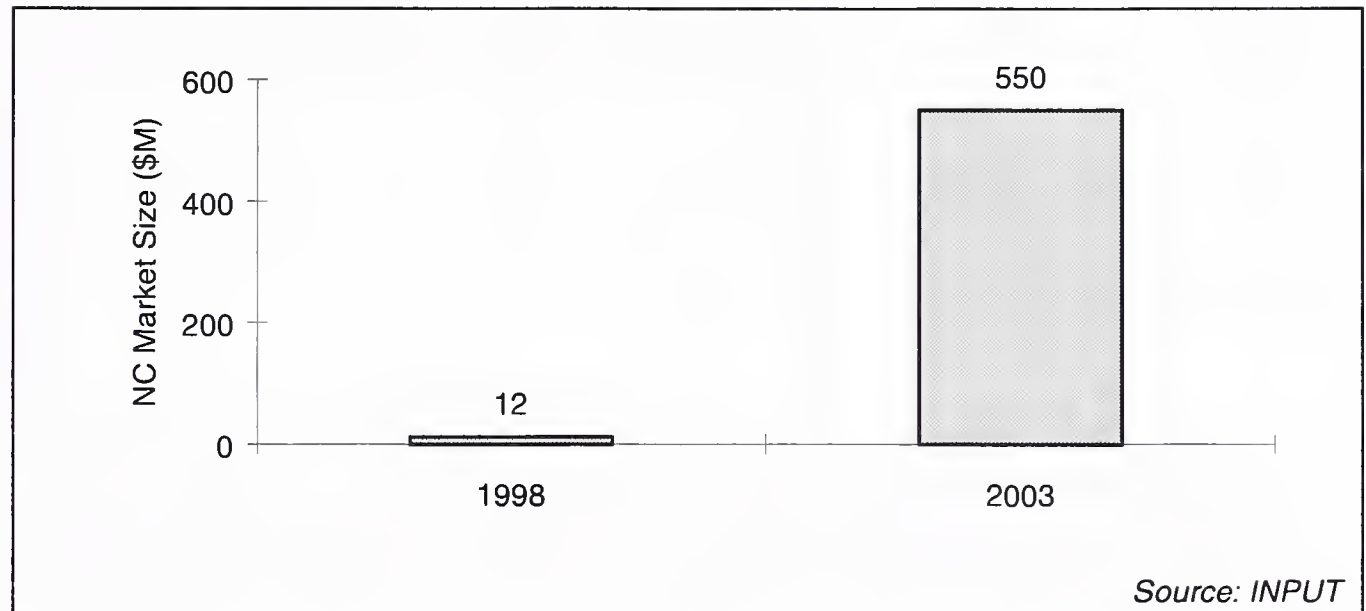
Federal NC sales initially represent only 6% of the overall U.S. NC market but will grow to 11% as federal agencies catch up to the market. The federal NC market averages 8% of the overall U.S. market over the next 5 years.

NC shipments for the federal government are expected to grow from 19,000 units in 1998 to almost 1.3 million units by 2003.

Exhibit IV-8 shows the federal NC shipment forecast.

Exhibit IV-8

### Federal NC Shipments Forecast



Source: INPUT
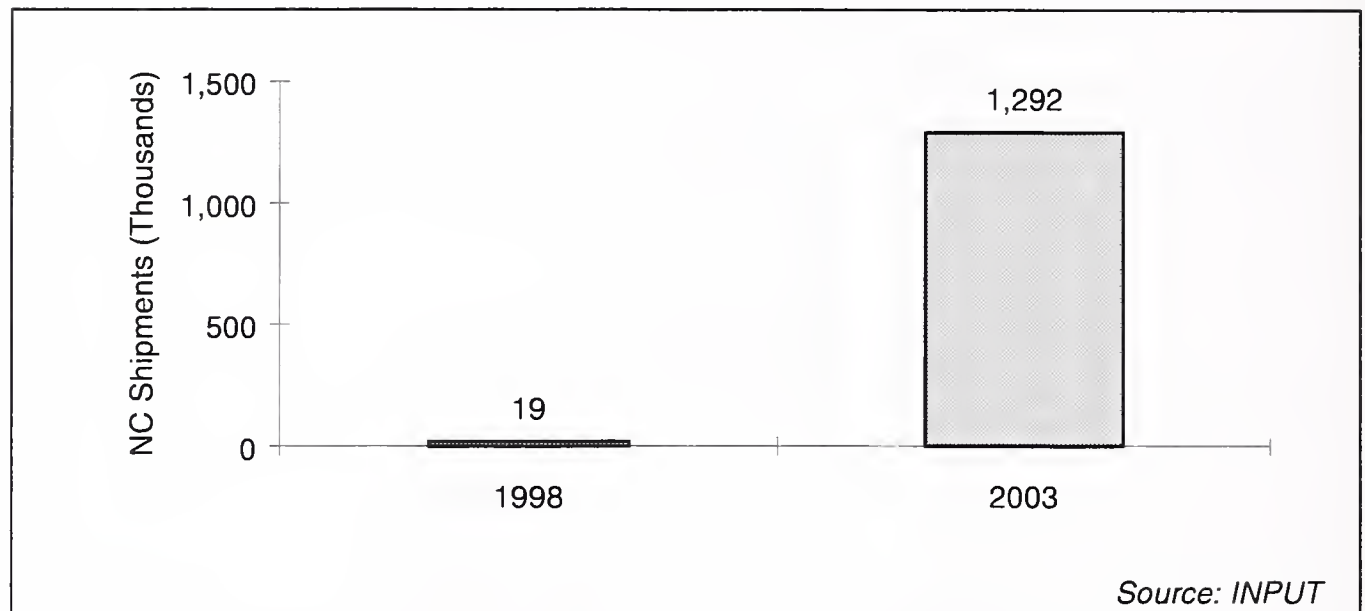
### Federal Forecast Detail

Civilian agencies NC spending is forecasted to be $7 million in FY 98, growing to $341 million by FY 03 with a CAGR of 116%. NC sales for defense are expected to total $5 million growing to $209 million over the same period with a CAGR of 113%. Civilian NC spending represents the largest part accounting for about 60% of federal NC sales.

Exhibit IV-9 shows the year-by-year federal NC spending estimates for civilian and defense as well as the overall federal NC market.

Exhibit IV-9

### Federal Network Computer Market ($M)

|  | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | FY98-03 CAGR |
|---|---|---|---|---|---|---|---|
| Total Federal | 12 | 42 | 110 | 230 | 413 | 550 | 115% |
| Civilian | 7 | 25 | 67 | 141 | 255 | 341 | 116% |
| Defense | 5 | 17 | 43 | 89 | 158 | 209 | 113% |

Source: INPUT

NC shipments for the federal government are expected to grow from 18 thousand units in FY 98 to almost 1.3 million units by FY 03.

Exhibit IV-10 shows the overall federal NC shipment forecast as well as between civilian and defense agencies.

Exhibit IV-10

## Estimated Federal Network Computer Shipments (Thousands)

|  | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|---|
| Total Federal | 18 | 68 | 189 | 452 | 866 | 1,292 |
| Civilian | 11 | 41 | 115 | 277 | 535 | 801 |
| Defense | 7 | 27 | 74 | 175 | 331 | 491 |

*Source: INPUT*

The future of NC computer sales looks promising in the U.S. federal sector. There is tremendous potential in the volume of existing desktop equipment as well as new applications as demonstrated in the amount of federal procurement activity with significant network equipment content.

V
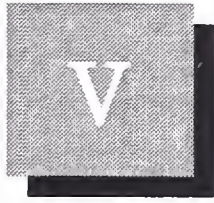
# Conclusions and Recommendations

Network Computers (NCs) are on the threshold of the federal market. Currently, the majority of federal use consists of pilot installations. Because of the slower than expected introduction of the NC into the commercial market, a large number of federal agencies have adopted a "wait and see" attitude, preferring to see some successful NC implementations at the major agencies before investing in NC technology.

Vendor success in this market will depend on a number of factors that will drive introduction of large volumes of NCs into the federal market in the near future.

This chapter discusses some of the conclusions that can be drawn from this report and provides strategic recommendations to vendors to the federal NC market.

## A

## General Observations

### Federal Market Demand

The federal government represents a tremendous potential NC market with a huge population of existing terminals, PCs and workstations and heavy continued demand for the foreseeable future.

The proportion of government rank-and-file workers and managers who are transaction users and fit the NC individual user profile is even greater than in the commercial market.

Civilian and defense agencies are under tremendous pressure to cut expenses, improve productivity and offer more services. The NC has advantages in all of these areas.

The advent of the digital economy is driving the demand for more electronic access to information and there will be a proliferation of more public-use equipment such as kiosks and public terminals. The NC can provide easy Intranet and Internet access and is well suited for kiosks and public-access terminals.

The popularity of Windows capable NCs in the commercial sector has been apparent. The commercial forecast shows that sales of Windows capable NCs will be significantly larger than Java-based machines. The reason for this preference is the wide proliferation of Windows products in the commercial environment. There is a similar proliferation of Windows products in government office desktop environments and sales of Windows capable NCs should be similar.

## Market Inhibitors

The government traditionally prefers proven technology, especially for business systems. The slow initial acceptance of NCs in the commercial marketplace has contributed to the perception that NCs are not well established and their success is uncertain.

Despite the advantages of central administration, NC dependence on servers and special software adds a level of complexity that is troublesome to average procurement officers.

Existing procurement vehicles make it simple to buy PCs as the workstation of choice. PCs are a readily available alternative that does not require a high level of initial integration.

Misconceptions concerning NCs linger among both federal and commercial customers. Many view the NC as just a step above a non-programmable terminal and others are unsure about the complexities and performance of running Java or Windows applications from the server.

Other concerns focus on increased network and server load and that the NC's cost savings are merely shifted to another area of the network.

## Initial Federal Market

The NC is just beginning to accumulate a respectable number of commercial customers, which lends more credibility to the NC in the federal market.

Despite the inhibitors to NCs in the federal market, there are a number of NC pilots and small installations scattered through both civilian and defense agencies. These installations demonstrate federal interest in the

NC concept and although initial results have been positive, they have not prompted major conversions to date.

## B

## Conclusions

The federal NC marketplace has tremendous potential that has yet to be realized. Although the civilian market is larger than the defense market, the opportunity in defense agencies is still attractive. The federal NC forecast in this report is predicated upon there being significant initial penetration of the federal market to provide a precedent for future sales.

Although there have been some NC pilots and minor installations in government sites, they will not be enough to drive significant volumes in the federal NC market without further initiatives from NC vendors.

Resource and budget constraints, coupled with increased demand for services as well as the need to modernize continue to drive the government IT administrators towards vendor solutions. Large systems integrators are the likely change agents to introduce NC technology in major government agencies in significant volumes. IT consultants providing business reengineering services to federal agencies will also play a major role in this market.

The cost advantages and ease of ongoing network management will be attractive to systems integrators who need to be efficient and cost-competitive. This is especially true for contracts where the vendor is responsible for ongoing upgrade and management of the government network installation.

The government is exploring seat management initiatives where they outsource workstations from a vendor who owns the equipment and is responsible for ongoing maintenance and updates. If seat management becomes widespread in the government-processing environment, the NC will present an attractive alternative to the PC for many cost-conscious vendors.

Procurement vehicles will play a role on the introduction of NCs in the federal market. Catalog-based vehicles such as GSA schedules, BPAs and GWACs do not typically offer solutions and are unlikely vehicles for initial NC sales. Because of their initial systems integration requirements for servers and software, the likely vehicles for NCs are competitive bids. Catalog-based vehicles would be most appropriate for NC sales only after a number of major federal NC installations are established.

PC manufacturers are already incorporating NC central management features into their devices.  At the same time, some NC manufacturers are adding function to their NC lines.  This convergence of the two product lines will have an effect on sales as vendors position their products to their best advantage.

NC equipment and software vendors are continuing to enhance and refine their products to make them easier and more attractive to potential customers.  NC commercial success is gaining momentum and federal success should follow.

# C
# Recommendations

### Need for Vendor Initiatives

Despite its potential, the success of the NC in the federal market is by no means assured.  NC vendors will need to take the initiative to overcome the reluctance of federal customers to embrace this technology.

### Product Development

NC vendors need to continue efforts to make their products easier for customers to install and use with the least disruption to their existing IT environment and user population.  This includes widening the scope of existing applications and adhering to open architecture guidelines.

Since the NC is typically by design a limited function machine and the cost advantage and efficiency is derived from shared resources,  NC developers need to be very aware of customer wants and needs in order to compete effectively with PC product lines vying for the same customers.

### Promotion

Another focus area for federal NC vendors includes educating federal clients to dispel misconceptions about NCs, promote enhancements and advances and show the true benefits of NC installations to drive demand.  This can be accomplished through demonstrations, business shows, promotions, trade and industry press and targeted market communications.

Key factors to consider when doing market promotions is to ensure that the appropriate audience is defined and targeted and that the message is well defined and consistent.  The NC needs to be established as the best commercial practice as that is a major goal of federal agencies.

This is especially important considering the initial confusion in the NC marketplace.

### Value Proposition

The vendors should ensure they have a crisply defined value proposition for their products. The value proposition should be based on a prioritized list of customer needs that is addressed by the product.

Government agency officials are most receptive to vendors who have intimate knowledge of their business processes and problems. A vital step in selling NC technology is to demonstrate how they can best provide value to their operation.

### Cost of Ownership and Security

The top two NC benefits of interest to federal agencies INPUT contacted were overall cost of ownership and security. The vendors should be able to demonstrate the security advantages and provide a method for agencies to calculate total cost of ownership vs. PCs as part of their communications campaign.

### Reference Accounts

The most potent supporting argument is substantial and successful reference accounts for both commercial and federal customers. This foundation needs to be laid to provide credibility to the NC as a viable large-scale solution in the federal environment.

### Alliances and Partnerships

NC vendors would benefit from strong business relationships with key federal suppliers of IT consulting and systems integration services to ensure product placement. These important players can be found by identifying the major bidders on large federal contracts that have the most potential for NC content.

Long-standing federal systems integrators and consultants not only have an intimate knowledge of the customer environment and business processes, but also of the decision making process for their customer set. The relationship that is established over time is invaluable when seeking to introduce a new product.

NC vendors that have an in-house consulting and integration staff with existing sales relationships with the government should ensure that adequate communications are established between these functions and the NC development and marketing staff.
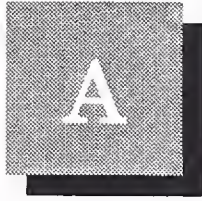
# Terms and Definitions

## A
## Introduction

This appendix provides:

- Definitions of the industry and market terminology encountered in research for this study

- A guide to the terminology employed in the written document.

These definitions and terminology are representative of common usage in the IT and network computer industry literature as best determined by INPUT at the time of this study.

## B
## General Terminology

Terminology describing vendor and agency relationships:

Vendor - The provider of goods and services.

Buyer - The person or agency organization that purchases good or services.

User – The person or agency organization that employs the goods and services directly or through an internal intermediary.

Customer – The agency in which buyers and users are employed

At times, the customer, buyer and user may be the same individual or unit but in many cases, they are separate individuals.

## C

# Network Computer and Industry Definitions

Network Computer (NC) – A computer with minimal memory, disk storage and sometimes processor power designed to connect to a network server that provides shared resource such as the application, data and sometimes processing power.

Java Terminal – A type of network computer designed to execute Java-based programs called applets locally. Java terminals typically have minimal processing capability and depend heavily on servers for storage and processing resources.

Windows Terminal – A type of network computer designed to run Windows applications typically through a Windows NT server.

Hybrid Terminal – A general purpose network computer that is capable of running both Java-based or Windows applications.

NetPC – Type of network computer initially developed by Microsoft and Intel capable of running Windows applications locally and remote network administration. NetPCs typically have provisions for a hard disk drive to act as cache storage to improve performance.

Client/Server – Network architecture where each computer or processor in the network is either an individual user workstation called a *client* or a computer called a *server* dedicated to managing a network resource. Users initiate and run applications from client computers and powerful servers manage disk drives, printers, network traffic and processing power.

Thin Client – Class of client/server software designed so the server performs the majority of data processing. Thin Client is also commonly used to refer to network computers without disk drives designed to act as the client in client/server architectures.

Fat Client – Client computer in client/server architecture that includes a disk drive.

Terminal – Traditional unintelligent workstation with display and keyboard that is typically attached to a legacy host system either locally or through a network to communicate with host-based applications. Terminals are often referred to as "dumb terminals" due to their non-programmable nature or "green screens" for their familiar green phosphor displays.

Java – A high-level programming language developed by Sun Microsystems designed to efficiently download applications in executable modules called applets from a server to a client where they are executed.

NC Profile 1 (NC-1) – Joint initiative by Apple, IBM, Oracle, Sun and Netscape to provide a common set of guidelines governing standard features and functions across a broad range of scalable Java-based NCs.

Applet – A small executable application that may be imbedded in another application to perform specific tasks.

Agent – A set of instructions that can carry out complex tasks automatically, typically across a network including sending messages or finding information.

Graphical User Interface (GUI) – A user interface designed to use icons or small graphical symbols as actuators for the functions in a program. For example, a user of a GUI interface may select an icon with their mouse to initiate a common function.

Internet – A publicly available network based on TCP/IP protocols that supports electronic mail, web sites and other communications solutions.

Internet Appliance - a class of consumer network computer devices commonly referred to as Internet appliances such as web-enabled televisions, communication-enhanced lighting and environmental controls and other "smart" appliances. It is also sometimes used to refer to business classes of network computers.

Intranet – A private network that emulates Internet technology and protocols but is only accessible by members of the private network. Intranets are commonly used by companies and organizations for proprietary internal communications and resource sharing.

LAN – Local Area Network

WAN – Wide Area Network

Web – World Wide Web (WWW) or Internet

# B
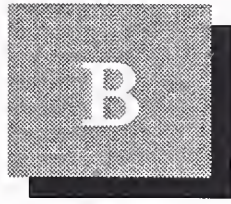
# Network Computer Equipment

Exhibit B-1

## NC Equipment by Vendor

| Vendor | Product | Type | Supported Applications |
|---|---|---|---|
| Accton Technology Corp. | LanStation, 2 models | NetPC | Windows 3.1, Win95, NT, Unix |
| Advanced Modular Solutions, Inc. | Secura, 4 models | NetPC | Windows 3.1, Win95, NT, Unix |
| Affinity Systems | Visara | NC | Windows 3.1, Win95, NT, Unix, Java |
| Boundless Technologies, Inc. | Viewpoint TC 100 | NetPC | Unix |
| Boundless Technologies, Inc. | Viewpoint TC 200 | NetPC | Windows 3.1, Win95, NT, Java |
| Compaq Computer Corp. | DeskPro 4000N | NetPC | Windows 3.1, Win95, NT, Java |
| Corel Corp. | Video NC | NetPC | Unix, Java |
| Gateway 2000, Inc. | E-1000 166 | NetPC | Windows 3.1, Win95, NT |
| Hewlett Packard Co. | Entria II Netstation, Envizex II Netstation | NC | Windows 3.1, Win95, NT, Java |
| IBM Corp. | IBM Network Station 3 models | NC | Windows 3.1, Win95, NT, Java |
| Idea Associates, Inc. | Internet Client Station | NC | Windows 3.1, Win95, NT, Java |
| MicroMedia Solutions, Inc. | TeleVista | NC | Windows 3.1, Win95, NT, Unix, Java |
| NCR Corp. | NCR 2990 TC | NC | Windows 3.1, Win95, NT, Unix, Java |
| Neoware Systems, Inc. | Neostation and @workStation | NC | Windows 3.1, Win95, NT, Unix, Java |
| Network Computing Devices, Inc. | Explora, 3 models | NC | Windows 3.1, Win95, NT, Unix, Java |
| Sun Microsystems, Inc. | JavaStation | NC | Java |
| Tatung Company of America, Inc. | TNC, 3 models | NetPC | Windows 3.1, Win95, NT |
| Tektronix, Inc. | NC200 Series and Thin200 Series | NC | Windows 3.1, Win95, NT, Unix, Java |
| Wyse Technology | WinTerm 4300SE | NC | Windows 3.1, Win95, NT, Unix, Java |

Source: INPUT

C
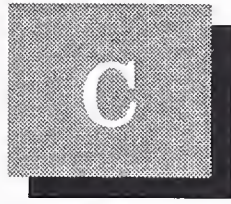
# Assessment Criteria

The following discusses assessment criteria to evaluate when Network Computers (NCs) are a viable solution in any given IT environment. General guidelines are provided as well as simple techniques to determine if a NC solution is appropriate.

## A
## General Guidelines

When are NCs Appropriate

The strength of the NC is that it provides a lower cost alternative to PCs in applications that require a limited and well-defined set of processes and provides better controls and security through central administration. NCs are also a modern alternative to the traditional non-programmable terminal allowing a graphical interface and web-enabled applications as well as speeding local processing as each keystroke is not transmitted back and forth to a central host system to be processed in turn.

NCs are appropriate in transaction-centric environments where the predominance of data processing consists of viewing data, data input, simple data queries and data updates in pre-determined fields. The transaction-centric environment is common to a majority of data processing applications.

PCs are more appropriate in power processing environments where data is used in processor-intensive applications such as graphics, publishing, modeling and applications where peripherals are required.

Typical environments that should be considered for NC installation are:

- Replacement and modernization of traditional non-programmable terminals

- Replacement of older PC technology

- Replacement for newer PC technology where the applications fit the transaction-centric processing environment

- New applications where Java-based or Windows-enabled applications can be run from the server and deliver the desired level of processing

# B
# Business Process Evaluation

Process Analysis

A straightforward technique used by systems analysts is to analyze key business processes to identify the type of processing environment is prevalent.

1. The first step is to create a list of essential business processes that are performed in your business function.

2. For each process, the process steps should be identified. For each step, the data processing needs to be examined to determine if it is transaction-centric or power computing centric.

3. The groups of workers performing each function should be identified to determine if there are commonalties and natural divisions according to processing type commonly performed.

4. Groups that are transaction-centric are most likely candidates for NC placement.

Application will be an important factor in determining if NCs are appropriate. Some applications may not be available for NCs. One major consideration is whether access to the web or graphical user interfaces (GUI) are to be used.

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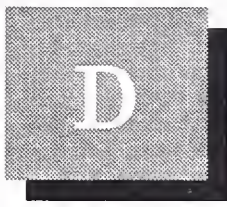
# Agency Questionnaire

1.  Has your agency implemented or are they planning to implement Network Computer solutions?

      Yes   ____

      No   ____

2.  What type of installation is your agency planning and do you have an implementation timeline in place?

3.  What is your agency's primary operating environment?

Windows NT     _____

Novell     _____

Mac OS     _____

DOS     _____

Unix     _____

Other     _____

4.  Do you currently have NCs installed at your agency?  How many?

5.  In your organization, what types of applications, if any, will be run on the NC?  (Check all that apply)

Information Analysis \_\_\_\_

Management \_\_\_\_

Graphics \_\_\_\_

Systems Engineering/Design \_\_\_\_

Communications \_\_\_\_

Office Automation \_\_\_\_

Human Resources \_\_\_\_

Logistics \_\_\_\_

Project Management \_\_\_\_

Artificial Intelligence \_\_\_\_

Accounting \_\_\_\_

Administration \_\_\_\_

Other _____

6.  Please rate the importance of the following criteria in deciding to use NCs as a solution?  (5=most important)

Circle One

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Life Cycle Cost | 1 | 2 | 3 | 4 | 5 |
| Initial Cost | 1 | 2 | 3 | 4 | 5 |
| Functionality of NCs | 1 | 2 | 3 | 4 | 5 |
| Fit with Necessary Applications | 1 | 2 | 3 | 4 | 5 |
| Ease of Use | 1 | 2 | 3 | 4 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| Demand from Users | 1 | 2 | 3 | 4 | 5 |
| Industry Advice | 1 | 2 | 3 | 4 | 5 |
| Speed of Implementation | 1 | 2 | 3 | 4 | 5 |
| Other _____ | 1 | 2 | 3 | 4 | 5 |

7.  On a scale of 1 to 5 - with 1 being "not important" and 5 being "very important", please rate the benefits your agency expects to gain from adopting a Network Computer architecture?

| | | | | | |
|---|---|---|---|---|---|
| Potential Cost Savings | 1 | 2 | 3 | 4 | 5 |
| Scalability | 1 | 2 | 3 | 4 | 5 |
| Flexibility with Applications | 1 | 2 | 3 | 4 | 5 |
| Enhanced Security | 1 | 2 | 3 | 4 | 5 |
| Lower Demand on IT Support | 1 | 2 | 3 | 4 | 5 |
| Decreased Requirement for User Training | 1 | 2 | 3 | 4 | 5 |
| Availability of Vendor Support | 1 | 2 | 3 | 4 | 5 |
| Improvement of the Business Process | 1 | 2 | 3 | 4 | 5 |

8.  What key factors would you consider when selecting a vendor to address your NC needs?

| | | | | | |
|---|---|---|---|---|---|
| Proposed Technical Solution | 1 | 2 | 3 | 4 | 5 |
| Life Cycle Cost | 1 | 2 | 3 | 4 | 5 |
| Initial Cost | 1 | 2 | 3 | 4 | 5 |
| Risk Containment Measures | 1 | 2 | 3 | 4 | 5 |
| Contract Type to be Used | 1 | 2 | 3 | 4 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| Project Management Skills | 1 | 2 | 3 | 4 | 5 |
| Qualifications of Vendor Personnel | 1 | 2 | 3 | 4 | 5 |
| Past Performance | 1 | 2 | 3 | 4 | 5 |
| Business Size | 1 | 2 | 3 | 4 | 5 |
| "Best Value" | 1 | 2 | 3 | 4 | 5 |
| Other _____ | 1 | 2 | 3 | 4 | 5 |

9. Please answer the following questions "yes" or "no" based on your perception or experience with Network Computers:

_____ The potential cost savings resulting from replacing PCs with NCs are highly attractive.

_____ Rapidly increasing functionality of NCs make them suitable for many federal applications.

_____ Security problems resulting from fully-configured PCs are proliferating.

_____ NCs permit a highly desirable streamlining of IT support resources.

_____ Users are finding NCs increasingly attractive in relation to their job assignments.

Comments:

10. On a scale of 1 to 5 - with 5 being "very significant", please rate the potential disadvantages of NC architecture in the federal environment:

Restricted Functionality for Users _____

Inadequate Ability to Run Applications _____

Limits on Software Availability _____

Connectivity Issues _____

Poor Cost-Benefit Ratio _____

Lack of Familiarity Among Users                              _____

Incompatibility with Existing IT Infrastructure    _____

User Reluctance to Give Up Full Function PCs      _____


11. What is your agency's estimated dollar or percentage of IT expenditure on NC products and services?

FY 98          _____
FY 99          _____
FY 00          _____


12. On a scale of 1 to 5 - with 5 being "most suitable", please rate the following vendors as potential providers of products and services to support your NC implementation:

AT&T                                    _____

Digital Equipment Corp.                 _____

Hewlett-Packard                         _____

IBM                                     _____

Intel                                   _____

Microsoft                               _____

Oracle                                  _____

Sun Microsystems                        _____

NCR                                     _____

Compaq                                  _____

Wyse                                    _____

13. How important and how satisfied are the following aspects of the vendor's approach toward NC architecture implementation? (Please rate on a scale of 1-5 where 1=unimportant/dissatisfied and 5=very important/very satisfied)

| | Importance | Satisfaction |
|---|---|---|
| Understanding Agency's Requirements | | |
| Sense of Responsibility for Your Goals | | |
| Commitment to Achieving Requirements | | |
| Flexibility and Innovative Approaches | | |
| Responsiveness to Changing Environment | | |
| Willingness to Compromise | | |
| Responsiveness to Day-to-Day Issues | | |
| Continuity of Personnel | | |
| Openness of Communication | | |
| Level of Bureaucracy | | |
| Speed of Reaction to Request | | |
| Cooperation with Other Vendors | | |
| Caliber of Personnel Business/Technical Skills | | |

14. On a scale of 1 to 5, with 5 being the most important, rate the importance of the following trends on your organization's projected use of NC vendors.

Downsizing         1    2    3    4    5    Why?

Reengineering         1    2    3    4    5    Why?

Standards Compliance    1    2    3    4    5    Why?

New Business Processes  1    2    3    4    5    Why?

Open Systems         1    2    3    4    5    Why?

Computer Security     1    2    3    4    5    Why?

Procurement Reform    1    2    3    4    5    Why?

Budget Constraints     1    2    3    4    5    Why?

New Technology              1        2        3        4        5        Why?

Outsourcing                 1        2        3        4        5        Why?

Other _____      1        2        3        4        5        Why?

15. Based on your experience please rate criteria you would use to select vendors for future Systems integration projects. On a scale of 1-5 with 1 being not important and 5 being extremely important.

Category                              Importance

Quality of Work                       _____

Technical Competence                  _____

Timeliness (Solution Delivery)        _____

Cost Control                          _____

Flexibility/Innovation                _____

Understanding of Agency
Requirements                          _____

Effective Business Process            _____

Past Performance                      _____

Prior Agency Experience               _____

Other                                 _____

16. Please detail any future NC plans?

17. Do you have any advice for NC vendors to better fulfill your needs?

PG18U

18. How has the realization of the Y2000 problem affected your consideration of a Network Computer architecture?